2000 Summary Report of work conducted by the Missouri River FWMAO on Missouri-Yellowstone River's Pallid Sturgeon

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Study Area

Sampling for pallid sturgeons was primarily conducted on the first 20 miles of the Yellowstone River upstream form it's confluence with the Missouri River and the Missouri River from the confluence with the Yellowstone River downstream to Highway 85 Bridge near Williston, North Dakota. The primary purpose for collecting pallid sturgeon for 2000 was for propagation purposes.

Methods

Drift netting with modified trammel nets is the most effective method to capture adult pallid sturgeon for this area. The modified trammel nets are 120 feet in length and 8 feet deep and semi-buoyant with a one-half inch foam-core float line and 50 pound lead-core lead line. The net consists of two walls; one wall of 6" square mesh and the other wall consists of 10 inch square mesh. Both meshes are constructed of #9 multi-filament twine.

Each drift is timed with the use of a stopwatch and the time is recorded when the net is being deployed and when retrieval if started. Beginning in 1997, we collected global position coordinates using a Precision Lightweight GPS Receiver (PLGR) for each drift to develop a database of sampling coordinates and catch. This information will be used to develop a data layer of our sampling effort and results within Recovery Priority Area (RPA) #2. Waypoints were collected at the initial setting of the net, when the net set was completed and when we began to pull the net. This will provide information on the drift, drift distance, area sampled, as well as species sampled that will be incorporated onto a database layer for the map of the river and it's habitats.

Each pallid sturgeon captured is placed into a six-foot 'sheep tank' with fresh water. All morphological data is collected while the fish is in the water. Weight information is collected with the use of a stretcher and a hanging scale. All pallid sturgeon are scanned for PIT tags or other tags. Previous injuries are also noted. Field crews continue to collect meristic data on the dorsal and anal fin ray counts to incorporate into a character index developed by Sheehan (1998) and Dryer and Krentz (1996).

For all fish being transported, an injection of oxytetracycline (aqueous solution) at a rate of .045 ml/lb of body weight is injected inter-musculature to reduce stress and bacterial infections. Doses greater than 1.4 cc are split between two injection sites. Pallid sturgeon were also transported in a 0.5% salt solution to reduce stress.

Results

Most of the field work was directed toward the capture of broodstock pallid sturgeon for propagation attempts at Garrison Dam National Fish Hatchery. Crews from Montana Department of Fish, Wildlife and Parks, North Dakota Game and Fish Department and the U.S. Fish and Wildlife Service collaborated on these efforts. A total of 23 pallid sturgeon adults were captured (Figure 1) with the potential broodstock being transported to Garrison Dam NFH near Riverdale, North Dakota. There the adults are sexed and staged with an evaluation of their potential as broodstock. Broodstock sturgeon not suitable for spawning are released or returned to the confluence region.

Using the data available from the pallid sturgeon database for this sub-population, average length and relative weights were calculated over the last 10 years (Figure 2). Length frequency has been evaluated for the Missouri/Yellowstone River population (Figure 3).

Figure 1. Capture location for pallid sturgeon at the confluence of Missouri and Yellowstone Rivers during April, 2000

Discussion

Appendix One lists the fish that were sampled during the month of April and May. The fish were captured as a the result of a cooperative effort by Montana Fish, Wildlife and Parks and U.S. Fish and Wildlife Service. The main purpose for capturing these fish was for propagation purposes and efforts were primarily directed toward capturing broodstock pallid sturgeon that would be ready to spawn. Results of those spawning efforts have been reported by Garrison Dam NFH personnel in their annual report.

We calculated effort rates and catch rates for the last three years (Table 1) using the modified trammel nets. There is an indication that field crews have become fairly effective at capturing pallid sturgeon under certain environmental conditions. Some preliminary analysis does indicate that effort required to capture pallid sturgeon increases as the flows increase. It is unclear if this is a result of increased drift speed of the net, behavior of the net under high flows making it less effective, the increased stage height increases the amount of available habitat, or if the reduction in effectiveness is related to the fish moving more in response to flow. During 1999 and 2000, 36 pallid sturgeon were captured from within a one mile section of the river near the confluence of the Yellowstone River over a short time period prior to spring runoff (Figure 1). This type of catch frequency is similar to what is seen in the fall when the fish will appear to be congregated in "schools" or staging. Once flows increase in the spring, there appears to be a reaction by the fish to migrate upriver and disseminate throughout the available habitat in areas upriver in the Yellowstone River. Occasionally, congregations have been found during the suspected spawning period that would tend to indicate spawning concentrations. Although catch rates were calculated, this is not a random sampling and productive habitats are targeted and caution should be used for any analysis of relative abundance.

Pallid sturgeon effort and catch rates from 1998 through 2000.			
	1998(spring)	**1999(spring)**	**2000(spring)**
Catch by amount of time drifting	1 pls/96 minutes	1 pls/ 147 minutes	1 pls/ 36 minutes
Catch by # drifts	1 pls/39 drifts	1 pls/17.5 drifts	1 pls/4.8 drifts
Average drift time	7:02 minutes	8:25 minutes	7:34 minutes
Number of pallids captured	4	4	9
# of drifts	157	70	43
Total amount of time drifting nets	6:25:24	9:49:41	5:25:05
CPUE	.62 pls/1 hour drifting	.41 pls/1 hour drifting	1.66 pls/1 hour drifting

Table 1. Calculated effort and catch rates for pallid sturgeon captured by this office from 1998 through 2000.

Average length and relative weights have remained fairly constant over that past eight years (Figure 2). The data from 1992 is likely the direct result of sampling differences. Relative weights have ranged from 83 to 115 with an average of 100. This is indicative that the pallid population is generally in good condition. A significant decline would likely indicate a severe change in environmental conditions.

Length frequencies were calculated for adult pallid sturgeon captured from 1990 through 2000 (Figure 3). Length frequency classes were broken down into 50 millimeter length groups and the percent of fish per length group were calculated. Occasionally, a smaller pallid sturgeon is sampled, 1050 to 1200 millimeters, however, these are rare. In the case of one fish sampled in 2000, this fish later was identified as a hybrid based on morphological data applied to the index developed by Dryer and Krentz (1996,2000). Recruitment is totally lacking from this sub-population with the exception of the stocked fish from 1998. These fish have been resampled by Montana Fish, Wildlife and Parks occasionally from 1998 through 2000.

The number of recaptures has remained fairly constant over the last three years with about half of the fish or more being recaptures. This year's sampling resulted in a recapture rate of 50 percent for 24 fish captured by Montana Fish, Wildlife and Parks and U.S. Fish and Wildlife Service. Tagging operations have taken place with this population since about 1988 with about 34 adult pallid sturgeon being tagged in Recovery Priority Area (RPA)(above Fort Peck Reservoir) and

over 142 adults being tagged in RPA 2. At this time, we are assuming that tag loss and mortality is negligible. However, mortality will certainly become more of an issue in the next few years as the population senescences. Mortality rates for this population have been estimated using longevity (Hoening, 1983). Given a maximum age of 50 to 60 years, average annual mortality rates are calculated at 8.2 to 7.6 percent.

One of the males (1F477B3A65) captured this spring was a recapture from last year's spawning attempt. In order to identify if males are capable of spawning each year, this male was kept, but not planned to be used in propagation attempts. Following injection of luteinizing hormone, this male did produce viable milt which would indicate that males at least are capable of spawning in successive years.

One pallid sturgeon recaptured this past spring was originally captured in June, 1991. This male was held in a spawning attempt to that year. Due to the lack of female broodstock during the 1991 efforts, the fish was returned to the wild. Before release, a sample of the pectoral spine was collected for aging purposes. Observations from spring 2000, indicated that although it had healed, the spine had not regenerated. The fork length in 1991 was measured as 1479 millimeters (mm) and 1469 mm in 2000, a 10 mm difference. This difference can be accounted due to measuring error.

Another sturgeon captured (115676690A), was suspected of being a hybrid due to inconsistent morphological characteristics. Later, using character indexes, it was determined to be very suspect and was not used for propagation. Using the character index developed by Sheehan (1999), this fish scored 0.6903 which indicated a shovelnose sturgeon. Using the index developed by Dryer and Krentz (1996,2000), it scored 346 which fell between the shovelnose and pallid scores. These character indexes obviously need additional data to complete data gaps. This fish was identified as a female in April with small white eggs. Later staging efforts found these eggs had become black and a likely spawner for 2001.

As part of a project funded by the U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, Upper Basin Pallid Sturgeon Recovery Workgroup, and Western Area Power Administration, ten post spawn pallid sturgeon were implanted with radio/sonic transmitters in 2000. This project will utilize post spawn pallid sturgeon and long term (>5 years) transmitters to identify post and pre spawn behavior of pallid sturgeon. It is anticipated that utilizing their known sex, spawning date and movement patterns is will be possible to extrapolate potential habitats used for spawning. It is planned that approximately ten adults would be implanted each year for at least the next three years. Tracking will be accomplished with remote data logging stations as well as on the ground telemetry.

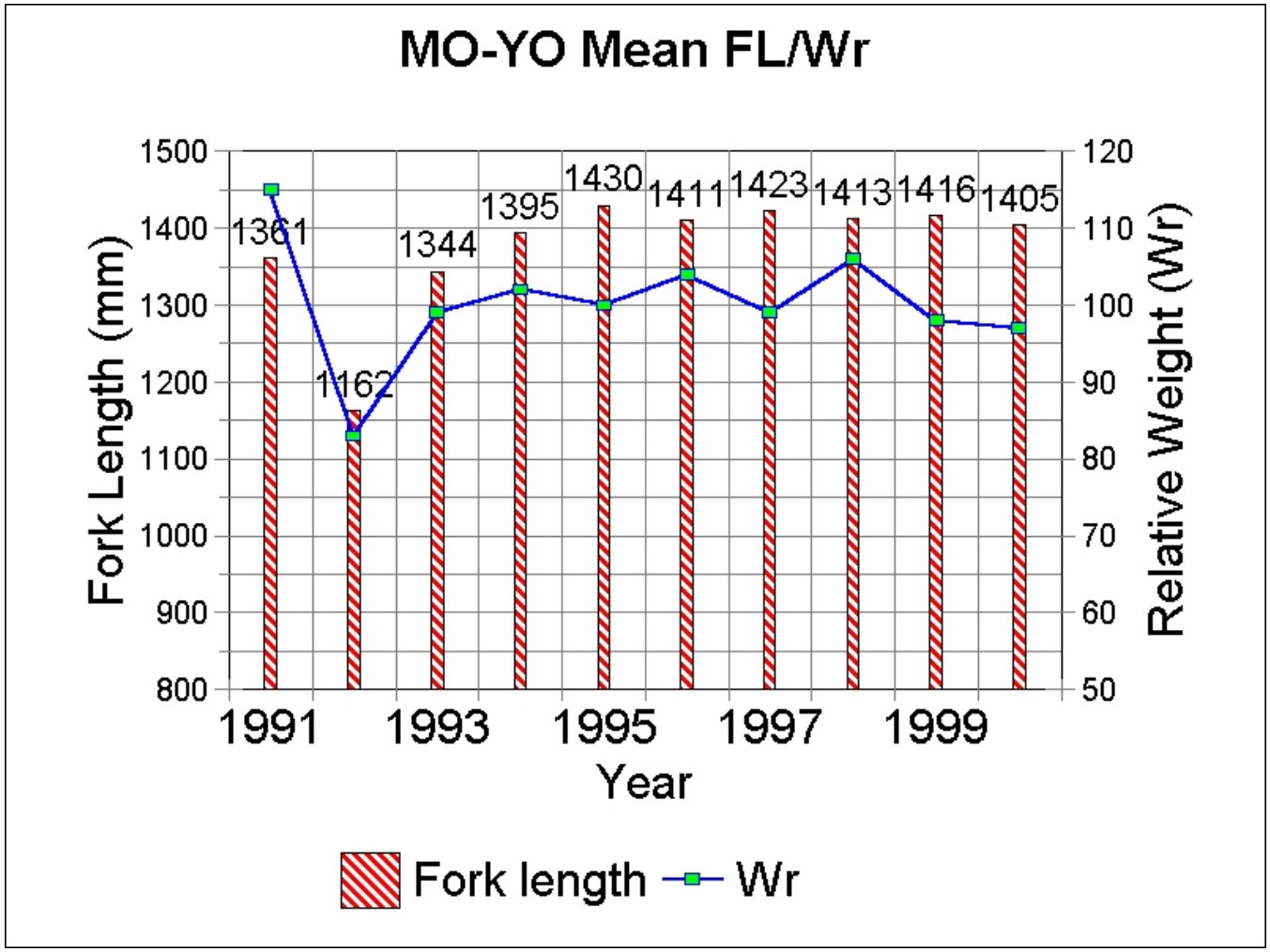

Figure 2. Average fork length and relative weight (Wr) for pallid sturgeon captured in RPA #2 in western North Dakota and eastern Montana from 1991 through 2000.

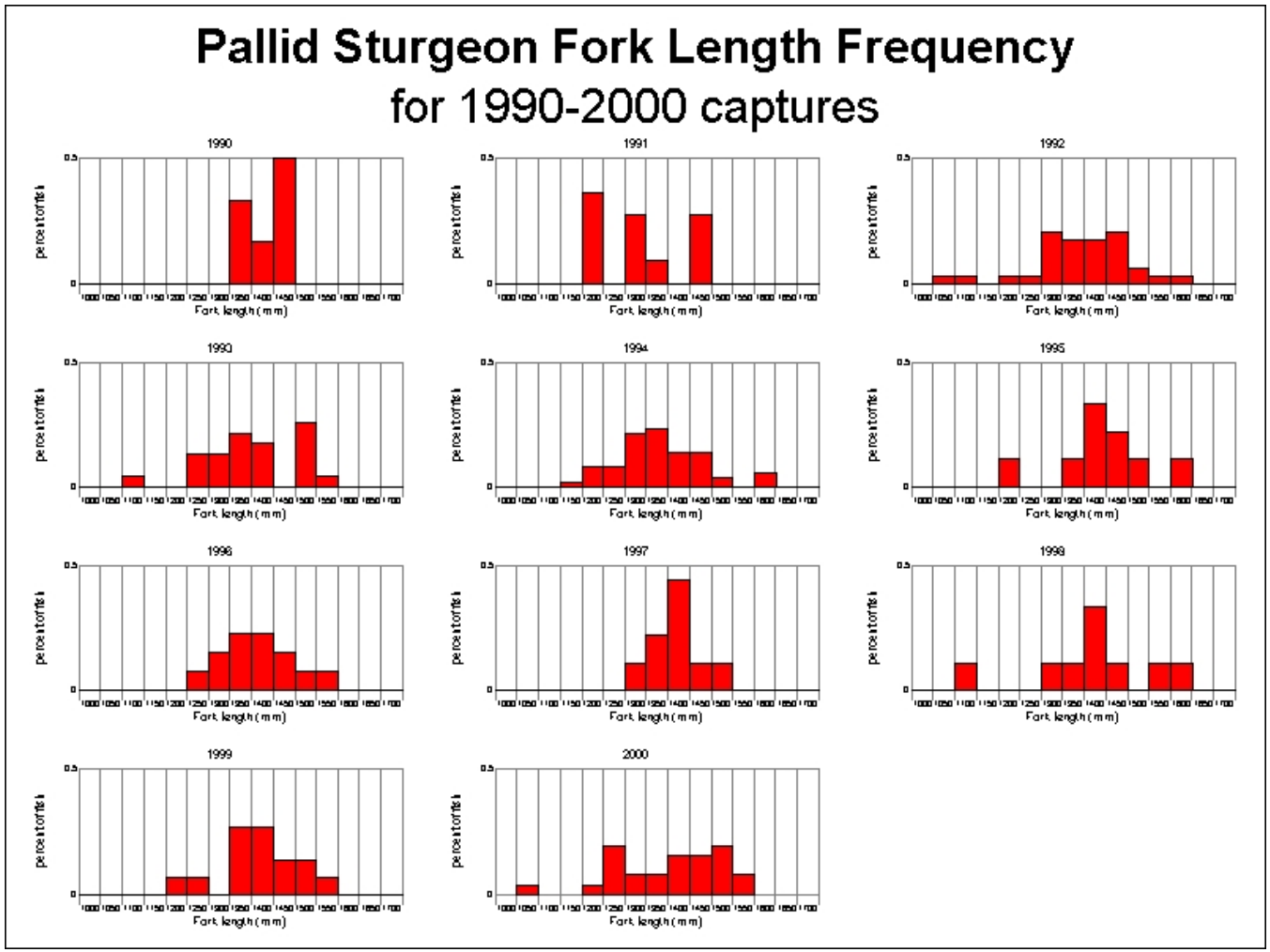

Figure 3. Fork length frequency for pallid sturgeon from RPA #2 in western North Dakota and eastern Montana from 1990 through 2000.

PIT tag #	Date of Capture	Location of capture: River & Rivermile (RM)	Sex	Name	Transmitter Code	Field Crew
1F4A24076C[A] 1F4A4E5772	04/18/00	Yellowstone Confluence	M			MTFWP
1F47715752[B]	04/11/00	Yellowstone Confluence	F	Annie	25	MTFWP
1F4A436E66	04/11/00	Yellowstone Confluence	F			USFWS
1F477B3A65[AB]	04/11/00	Yellowstone Confluence	M	Aaron	38	MTFWP
7F7F054773[AB]	04/11/00	Yellowstone Confluence	M			USFWS
7F7F065A3D[AB]	04/11/00	Yellowstone Confluence	F			MTFWP
1F4A143350[B]	04/11/00	Yellowstone Confluence	M	Andrew	50	USFWS
1F4B225A1A[A]	04/12/00	Yellowstone Confluence				USFWS
1F4A004552[AB]	04/12/00	Yellowstone Confluence	M	Al	22	USFWS
7F7B081579[AB]	04/12/00	Yellowstone Confluence	M	Andre	26	MTFWP
1F4A33194B[B]	04/12/00	Yellowstone Confluence	M	Archie	46	MTFWP
115712453A[B]	04/12/00	Yellowstone Confluence	M			MTFWP
1F4849755B[B]	04/13/00	Yellowstone Confluence	M	Art	18	USFWS
115713555A[B]	04/13/00	Yellowstone Confluence	F	Amber	62	USFWS
115676690A	04/13/00	Yellowstone Confluence	F	Hybrid		MTFWP
11552S534A[B]	04/17/00	Yellowstone Confluence	M	Alex	34	USFWS
220F0F6213[B]	04/18/00	Yellowstone Confluence	F			MTFWP

PIT tag #	Date of Capture	Location of capture: River & Rivermile (RM)	Sex	Name	Transmitter Code	Field Crew
2202236E31[B]	04/18/00	Yellowstone Confluence	M	Arnie	44	MTFWP
1F4A27214F[A]	04/13/00	Yellowstone Confluence	M			USFWS
7F7D433F0C[A]	04/13/00	Yellowstone Confluence				MTFWP
7F7D266242[A]	04/18/00	Yellowstone Confluence				MTFWP
7F7F065A4D[A]	04/18/00	Yellowstone Confluence	M			MTFWP
220F0E6207[A]	04/18/00	Yellowstone Confluence	M			MTFWP
7F7F06697C[A]	05/03/00	Yellowstone River RM 5.4	M			MTFWP

[A] indicates recapture
[B] indicates that this fish was used for spawning

Future Recommendations

- Concentrate collection of broodstock during the fall prior to spawning using spring captures only when necessary.

  Using this procedure increases our likelihood of having a successful propagation and reduces the amount of stress to the fish. Research and results to date would suggest that holding these adult fish over winter prior to spawning decreases the amount of stress during the spawning and does not have an adverse affect to propagation efforts.

- Continue augmentation program of pallid sturgeon and intensify monitoring of juvenile pallid sturgeon populations in their habitats.

- Ensure that all facilities that hold pallid sturgeon have adequate capability to keep densities low enough and conditions favorable for culturing pallid sturgeon to decrease likelihood of diseases and stress.

- Investigate the impacts to larval sturgeon survival of downstream riverine habitats.

  It is suspected that successful reproduction is occurring, however, lack of recruitment could be one of the main limiting factors of the pallid sturgeon population.

- Develop/utilize facilities at Garrison Dam NFH to retain a secondary source of pallid sturgeon progeny as a backup source for stocking purposes.

  Culturing the pallid sturgeon progeny at one facility, could allow a catastrophic event to eliminate that year's work. The main goal would be to culture excess pallid sturgeon at a second facility that would serve as a reservoir in the event that the primary source of pallid sturgeon broodstock would be lost.

- Continue to improve sampling efficiency of juvenile sturgeon.

- Increase efforts to develop fish by-pass on low-head dams on Yellowstone River and the tributaries to allow fish passage by pallid sturgeon to utilize the middle Yellowstone River for spawning purposes, as well, modify water intakes to reduce potential impacts by entrainment.

- Evaluate streamside modifications (rip-rap, weirs) and the impacts they may have on various in-channel habitats, especially shallow sandbar habitats.

Literature Cited

Hoening, J. M. 1983. Fishery Bulletin: Vol. 82, No. 1, pp 898-902.

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